# Figure 1A

**Step 1) Entering a person's data in the database**

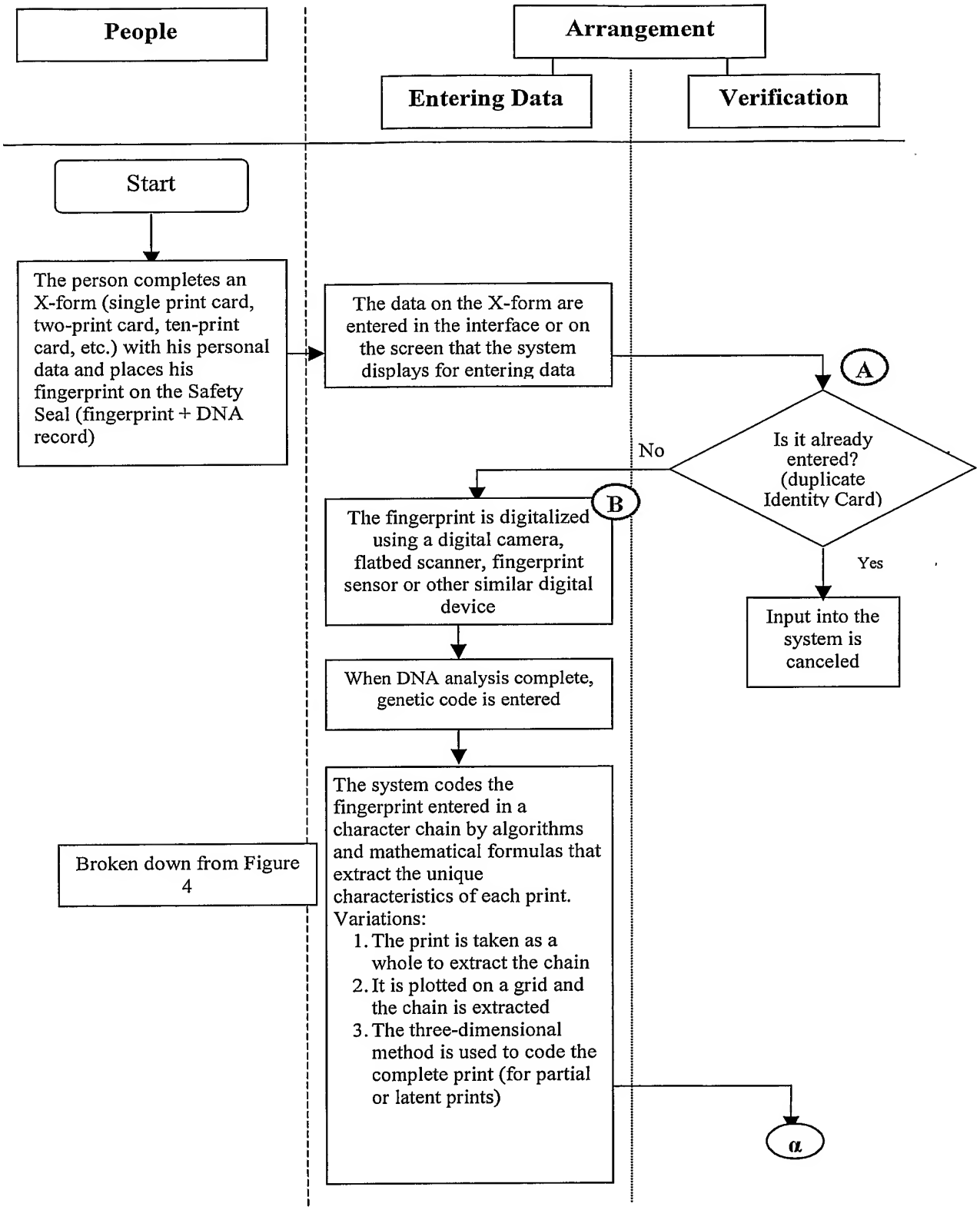


Figure 1B

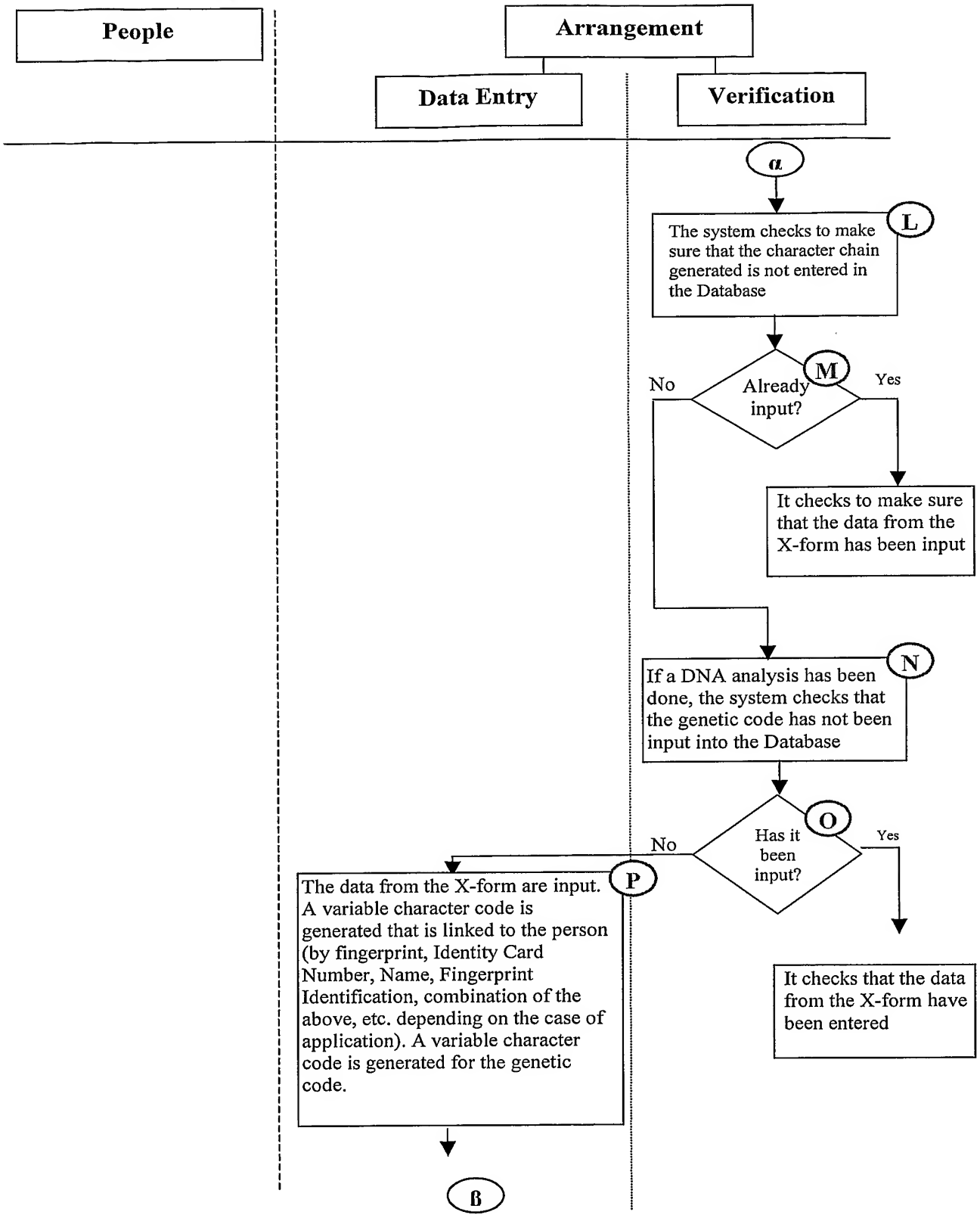
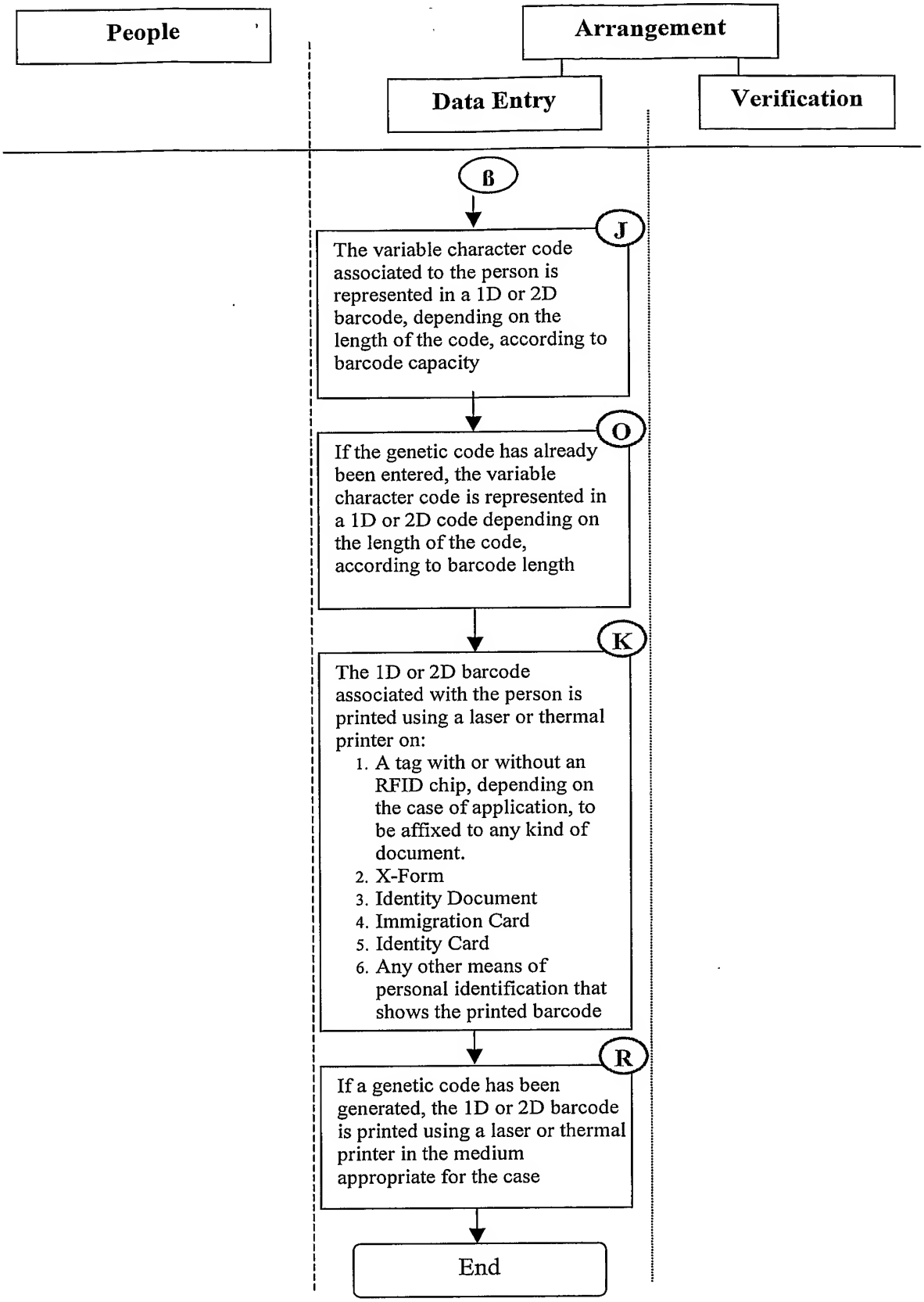

People
Arrangement
Data Entry
Verification
α
The system checks to make sure that the character chain generated is not entered in the Database
L
Already input?
M
No
Yes
It checks to make sure that the data from the X-form has been input
If a DNA analysis has been done, the system checks that the genetic code has not been input into the Database
N
Has it been input?
O
No
Yes
The data from the X-form are input. A variable character code is generated that is linked to the person (by fingerprint, Identity Card Number, Name, Fingerprint Identification, combination of the above, etc. depending on the case of application). A variable character code is generated for the genetic code.
P
It checks that the data from the X-form have been entered
ß

Figure 1C


People
Arrangement
Data Entry
Verification
ß
J
The variable character code associated to the person is represented in a 1D or 2D barcode, depending on the length of the code, according to barcode capacity
O
If the genetic code has already been entered, the variable character code is represented in a 1D or 2D code depending on the length of the code, according to barcode length
K
The 1D or 2D barcode associated with the person is printed using a laser or thermal printer on:
1. A tag with or without an RFID chip, depending on the case of application, to be affixed to any kind of document.
2. X-Form
3. Identity Document
4. Immigration Card
5. Identity Card
6. Any other means of personal identification that shows the printed barcode
R
If a genetic code has been generated, the 1D or 2D barcode is printed using a laser or thermal printer in the medium appropriate for the case
End

# Figure 2A

**Step 2) Verifying a Person's Identity**

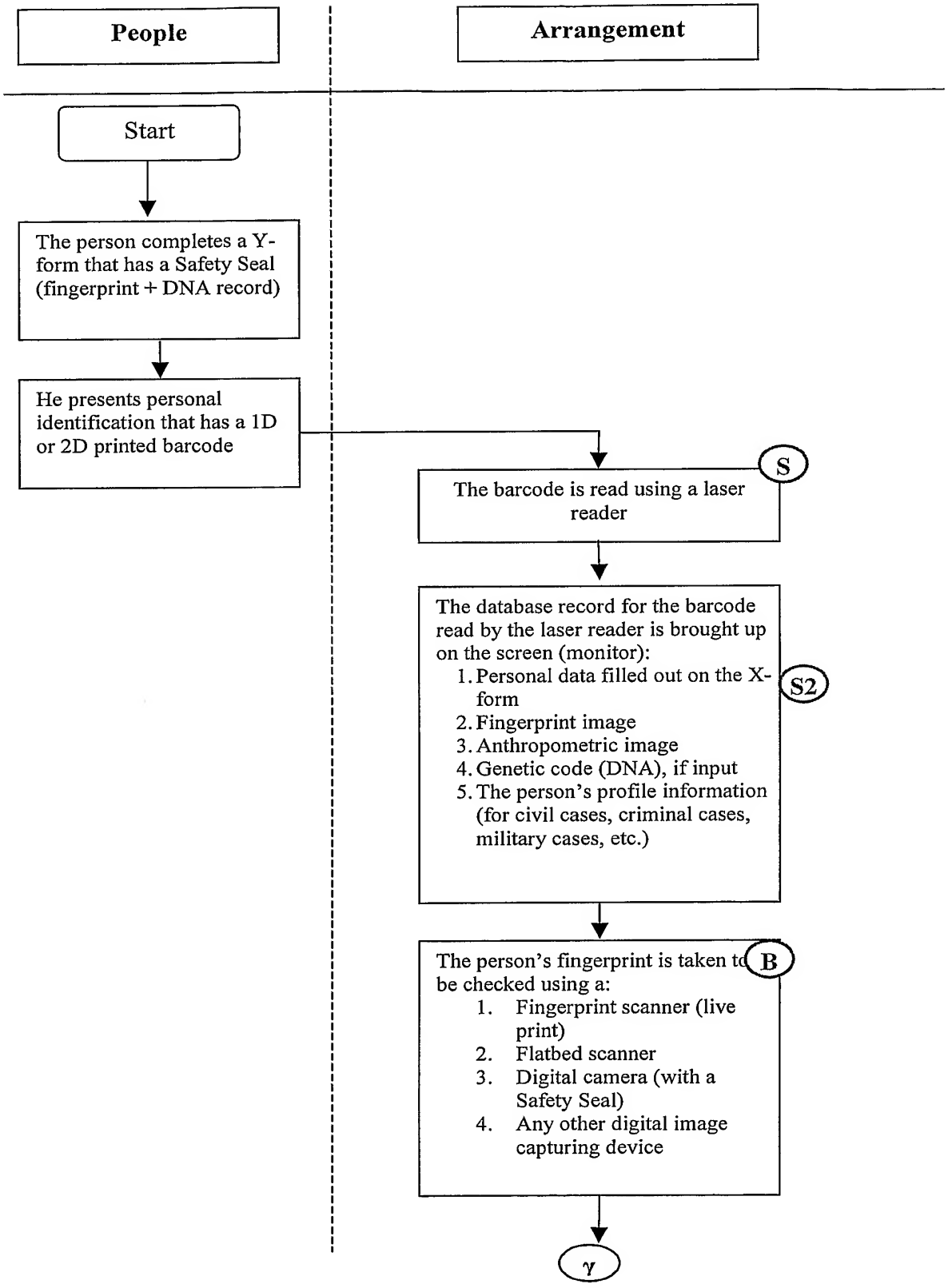
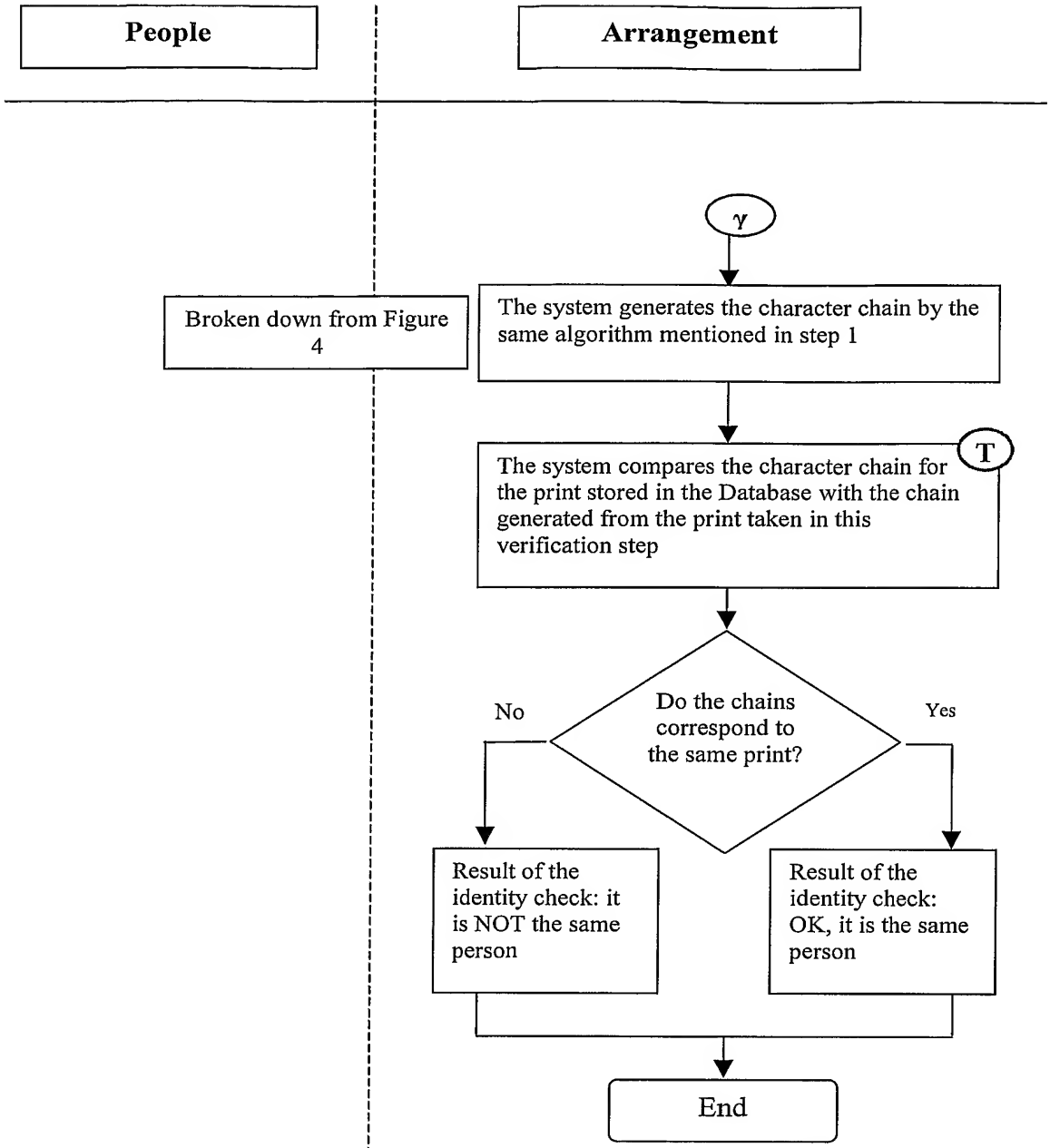
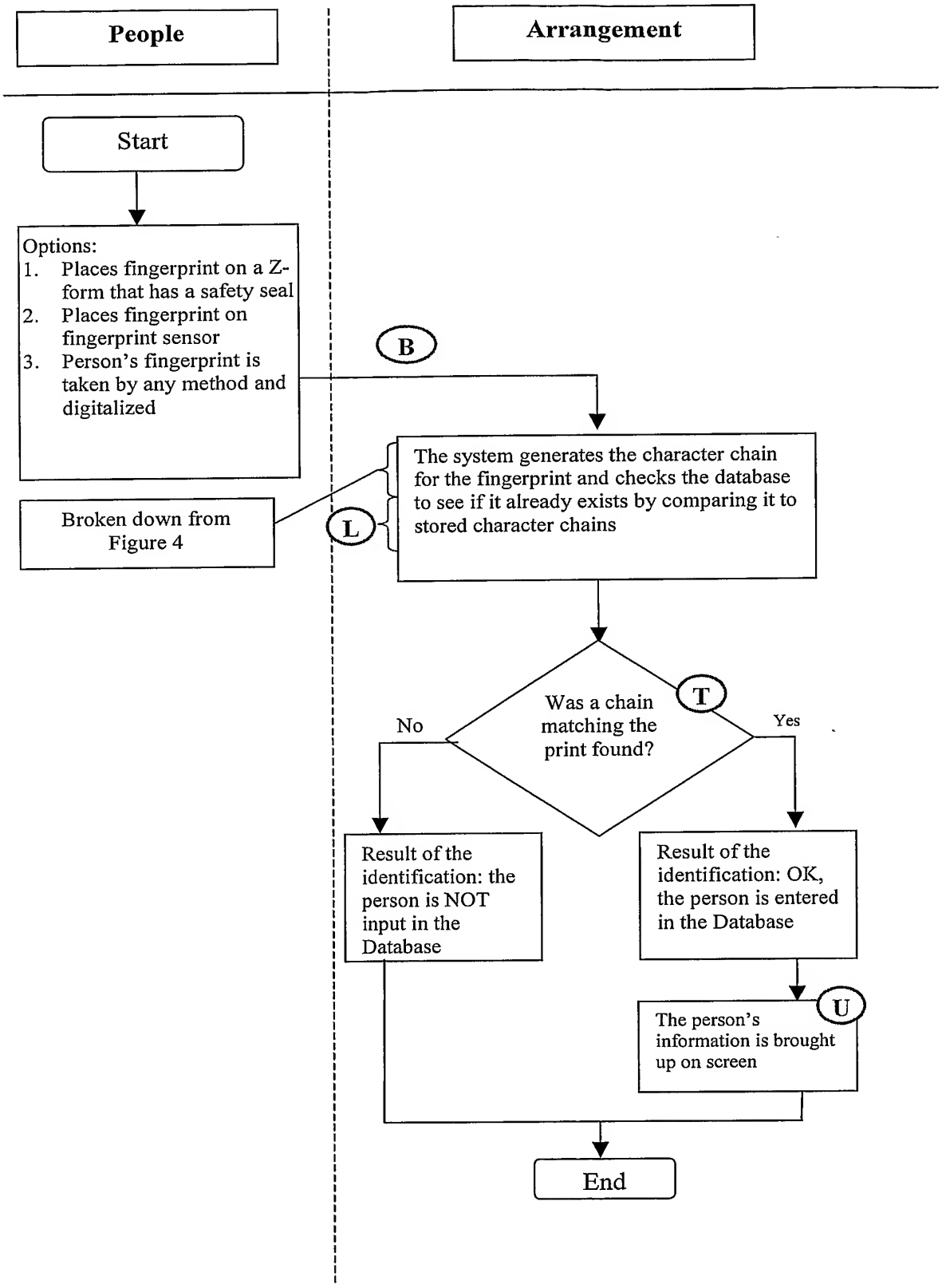


Figure 2B


People
Arrangement
γ
Broken down from Figure 4
The system generates the character chain by the same algorithm mentioned in step 1
The system compares the character chain for the print stored in the Database with the chain generated from the print taken in this verification step
T
Do the chains correspond to the same print?
No
Yes
Result of the identity check: it is NOT the same person
Result of the identity check: OK, it is the same person
End

# Figure 3A

**Step 3) Identifying a Person by a fingerprint**



# Figure 3B

**Step 3) Identifying a Person by DNA**

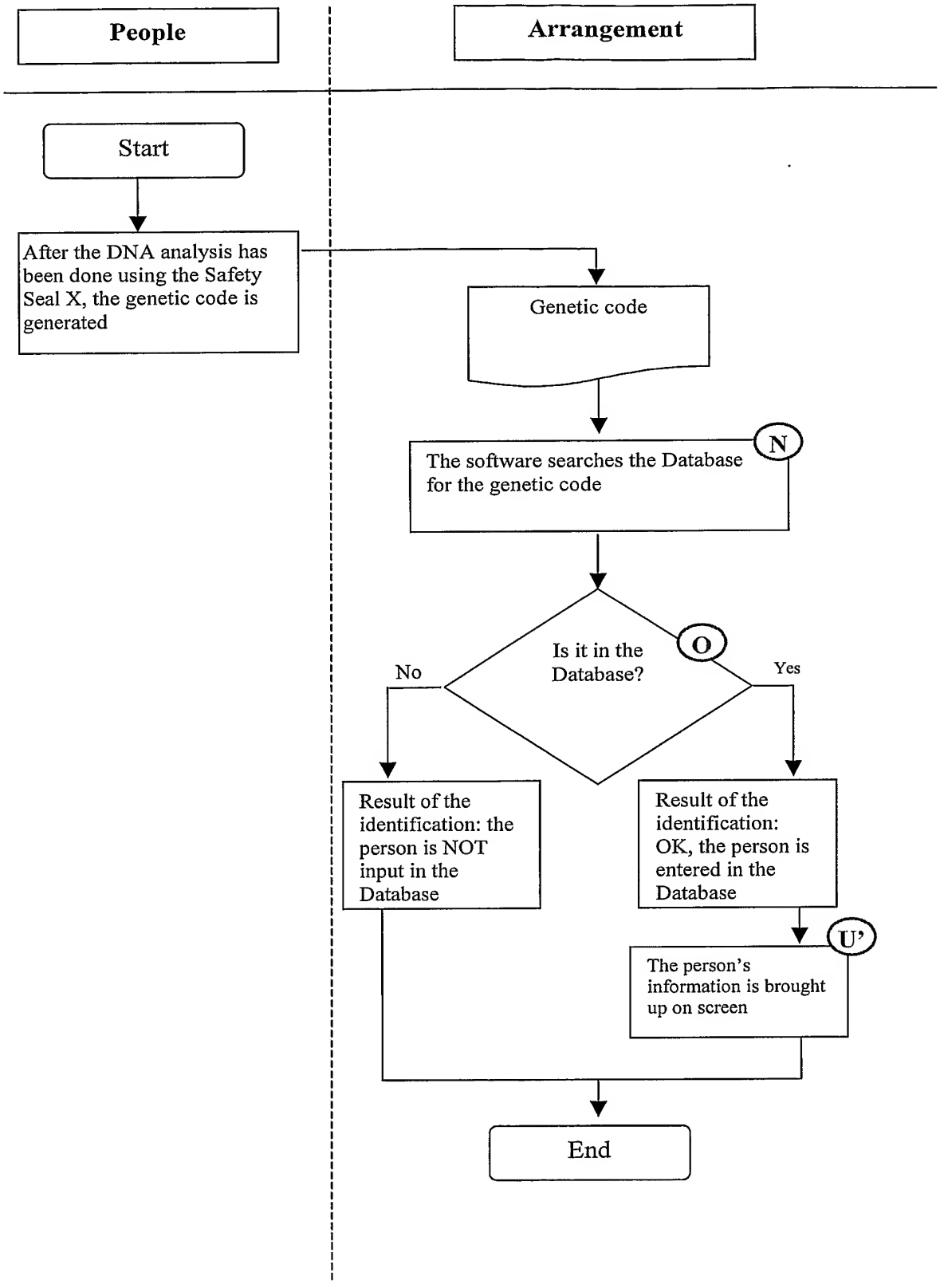
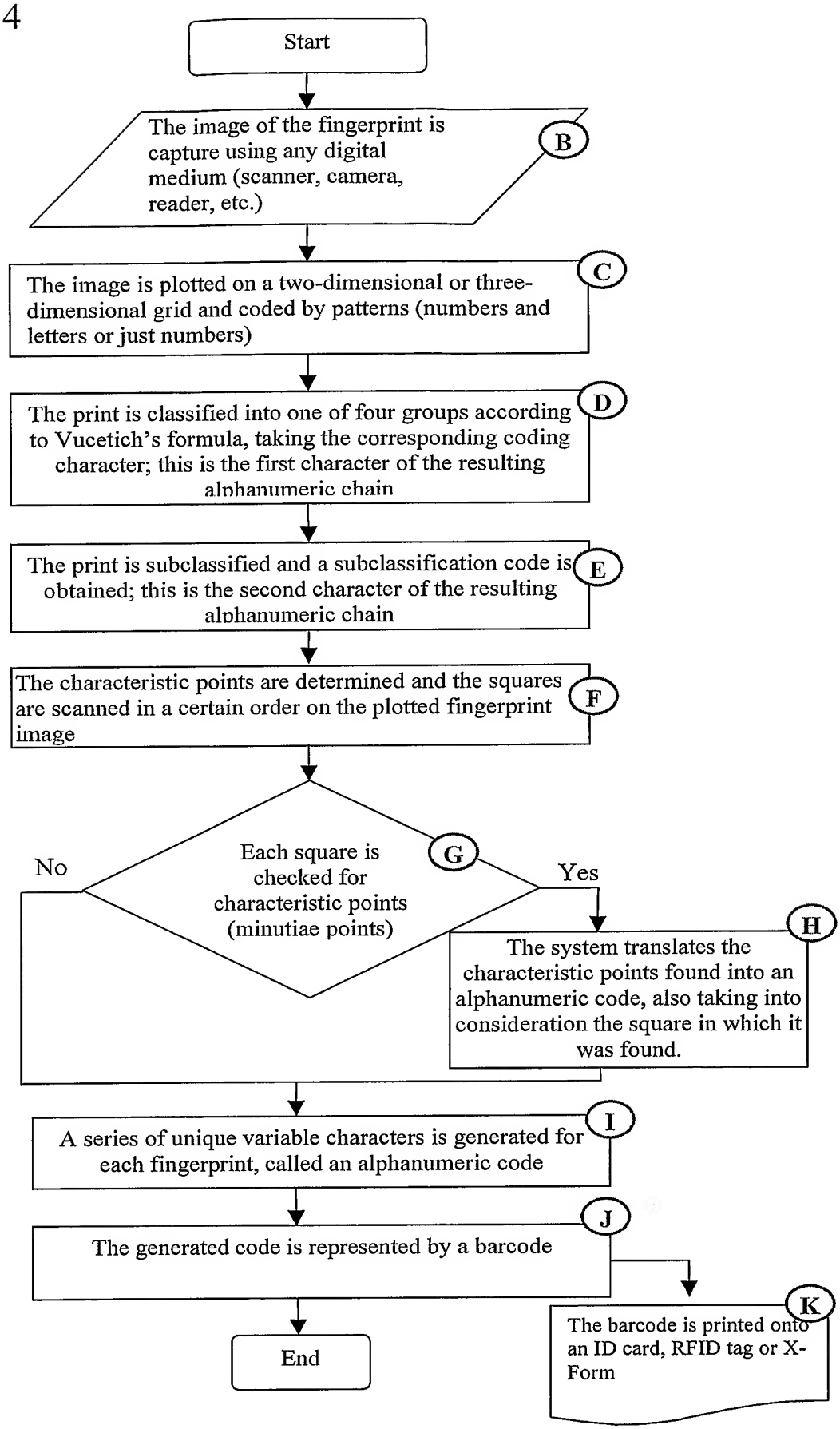
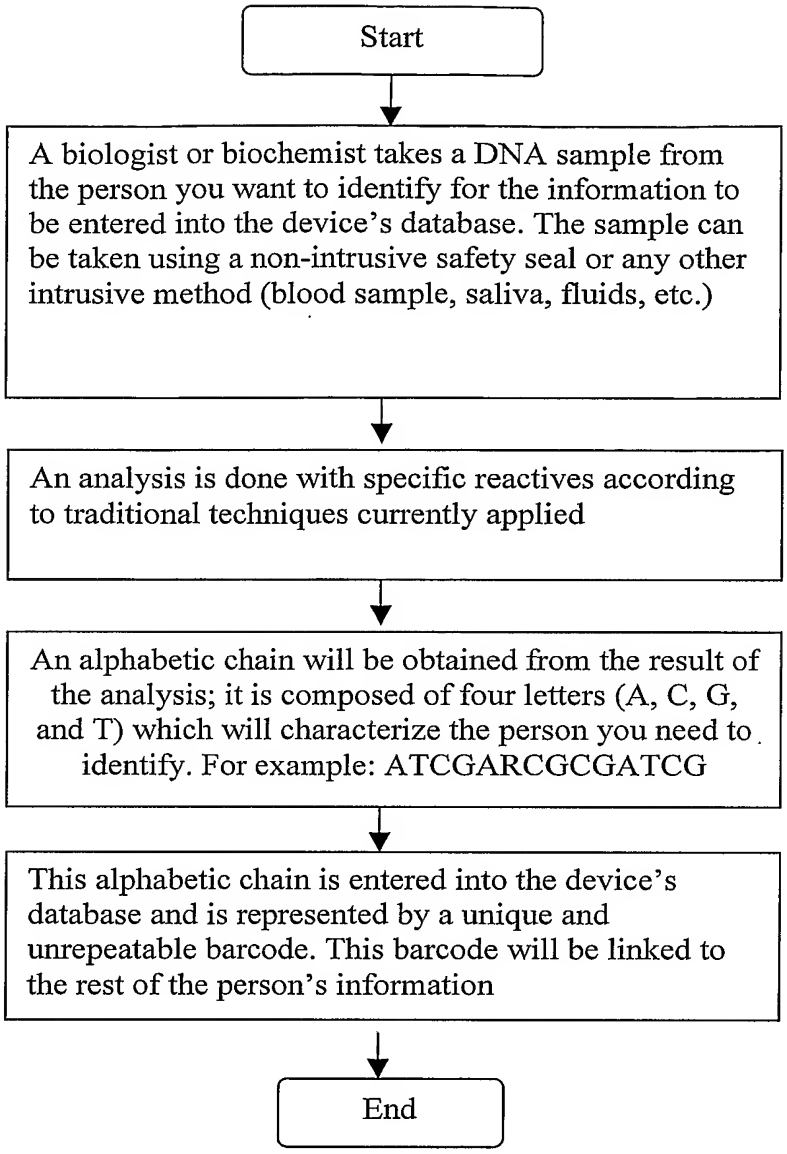


Figure 4

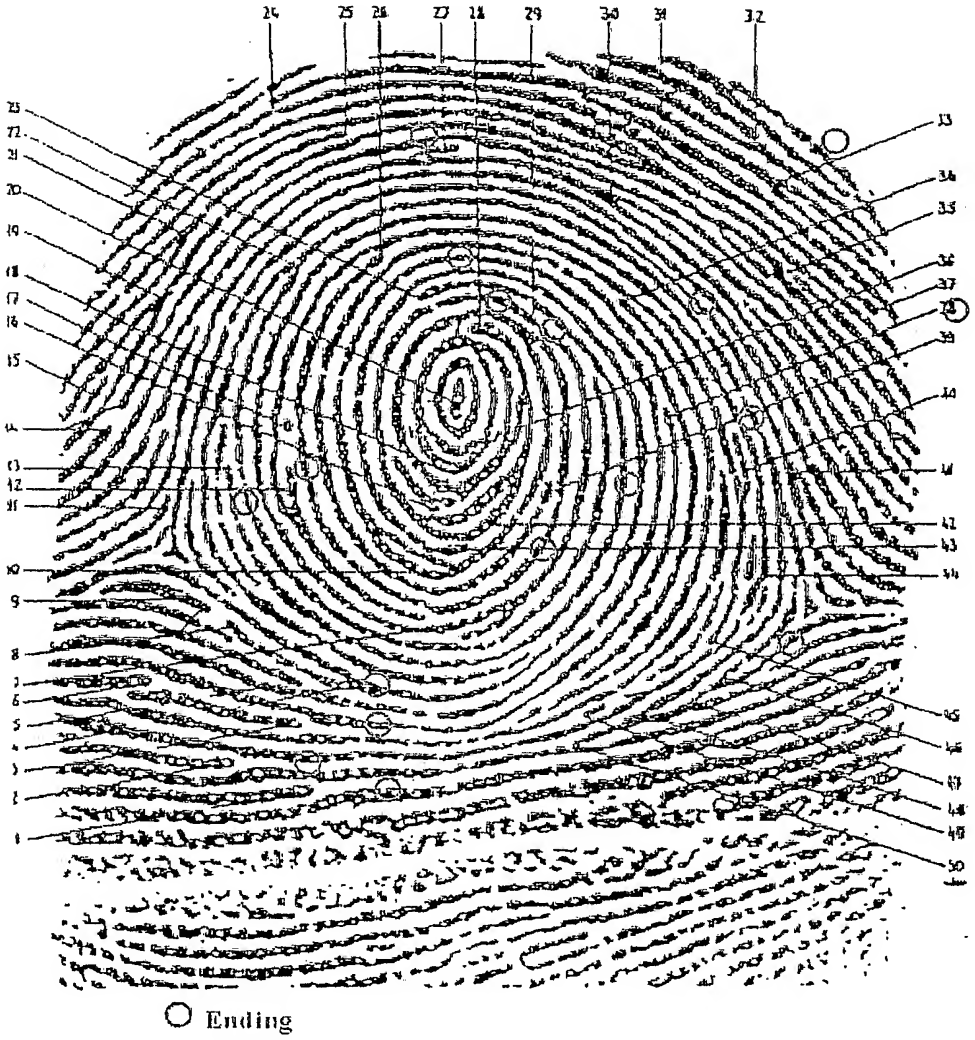

Start
The image of the fingerprint is capture using any digital medium (scanner, camera, reader, etc.)
B
The image is plotted on a two-dimensional or three-dimensional grid and coded by patterns (numbers and letters or just numbers)
C
The print is classified into one of four groups according to Vucetich's formula, taking the corresponding coding character; this is the first character of the resulting alphanumeric chain
D
The print is subclassified and a subclassification code is obtained; this is the second character of the resulting alphanumeric chain
E
The characteristic points are determined and the squares are scanned in a certain order on the plotted fingerprint image
F
Each square is checked for characteristic points (minutiae points)
G
No
Yes
The system translates the characteristic points found into an alphanumeric code, also taking into consideration the square in which it was found.
H
A series of unique variable characters is generated for each fingerprint, called an alphanumeric code
I
The generated code is represented by a barcode
J
End
The barcode is printed onto an ID card, RFID tag or X-Form
K

# Figure 5


Start
A biologist or biochemist takes a DNA sample from the person you want to identify for the information to be entered into the device's database. The sample can be taken using a non-intrusive safety seal or any other intrusive method (blood sample, saliva, fluids, etc.)
An analysis is done with specific reactives according to traditional techniques currently applied
An alphabetic chain will be obtained from the result of the analysis; it is composed of four letters (A, C, G, and T) which will characterize the person you need to identify. For example: ATCGARCGCGATCG
This alphabetic chain is entered into the device's database and is represented by a unique and unrepeatable barcode. This barcode will be linked to the rest of the person's information
End

## Figure 6

Infograph of a fingerprint and its characteristic points (minutiae points)

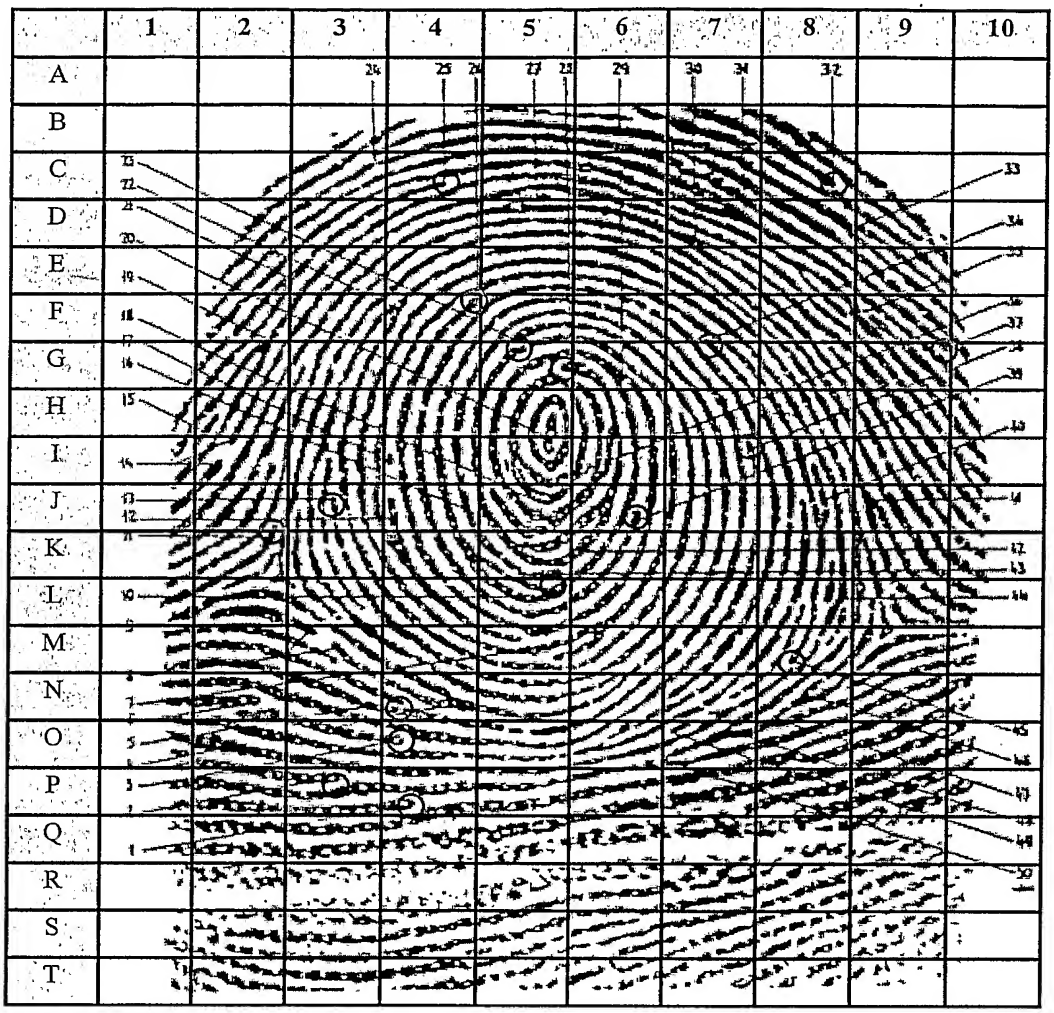



MARKED CHARACTERISTIC POINTS

The image shows the following points: 1, 2, 3 Ending; 4 Bifurcation; 5 Ending; 6 Deviation; 7 Bifurcation (lower outer branch cut); 8 Interruption; 9 Large fragment; 10 Large island; 11 Ending; 12 Bifurcation (inner upper branch cut); 13 Ending; 14 Interruption; 15 Fragment; 16 Bifurcation (outer branch cut); 17 Dot; 18 Large island; 19 Convergence; 20 Fragment; 21 Convergence; 22 Convergence; 23 Ending; 24 Interruption; 25 Ending; 26 Ending; 27 Small fragment; 28 Ending; 29 Bifurcation; 30 Bifurcation; 31 Convergence; 32 Ending, 33 Bifurcation; 34 Ending; 35 Transversal; 36 Bifurcation; 37, 38, 39 Ending; 40 Convergence (outer branch cut); 41 Bifurcation; 42 Large island; 43 Ending; 44 Transversal; 45 Ending; 46, 47, 48 Convergence; 49 Small fragment; 50 Convergence.

**Figure 7**

INFOGRAPH OF GRID MODEL



## Figure 8

Tented Arch Outer Loop Inner Loop Whorl

| TYPE | THUMBS | OTHER FINGERS |
|---|---|---|
| Arch | A | 1 |
| Inner Loop | I | 2 |
| Outer Loop | E | 3 |
| Whorl | V | 4 |

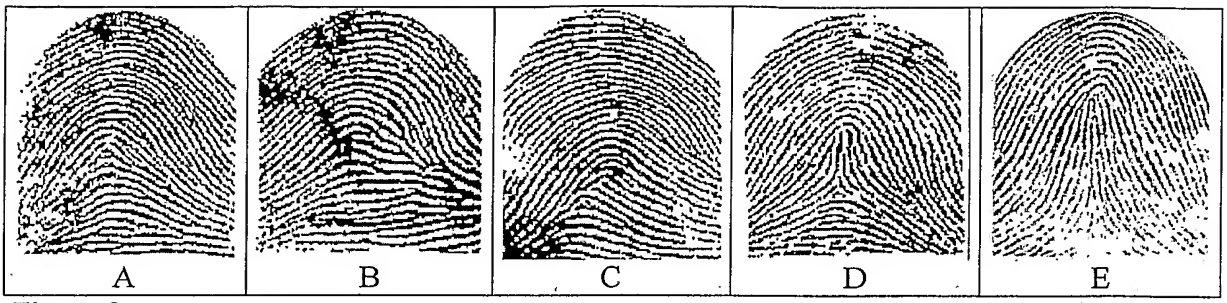



Figure 9

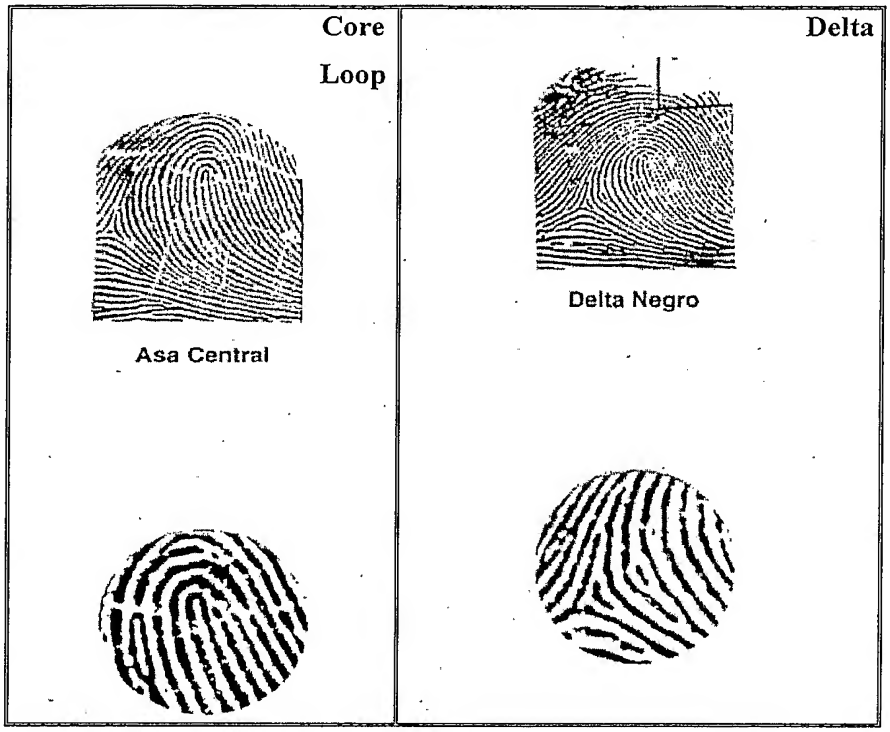
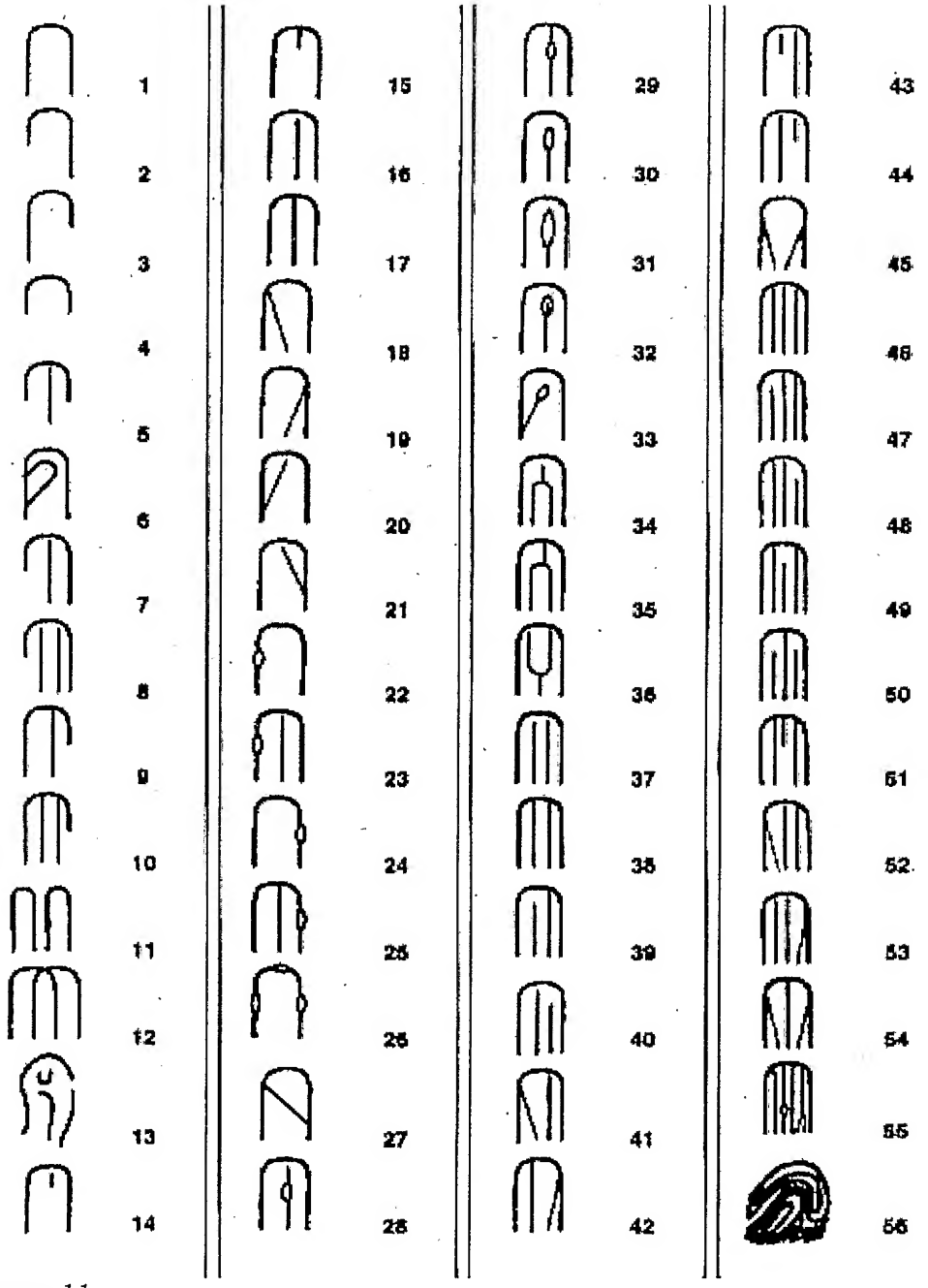



Figure 10

[text in Figure 5]
Delta Negro = Black Delta


1
2
3
4
5
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21
22
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Figure 11

Figure 12A

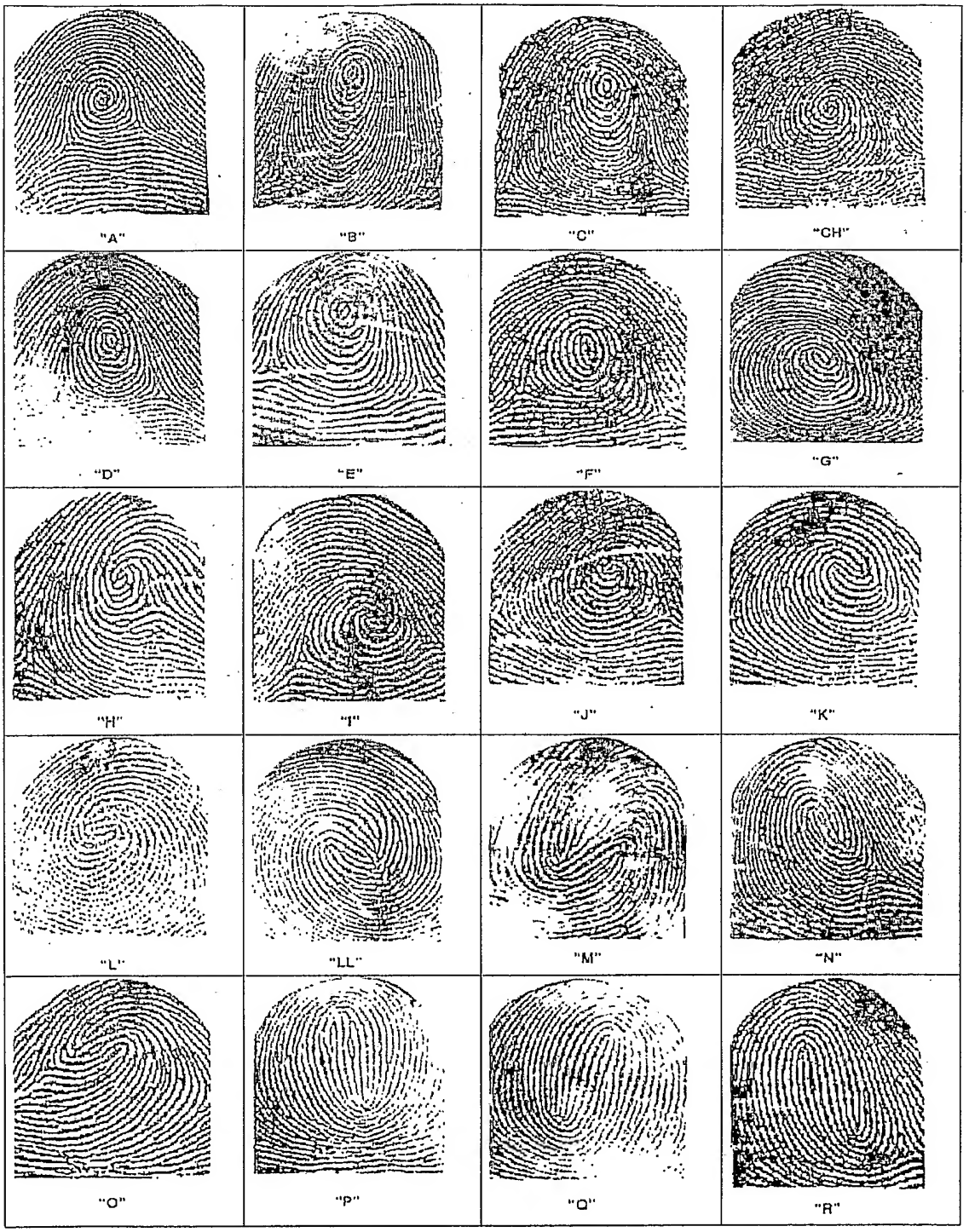
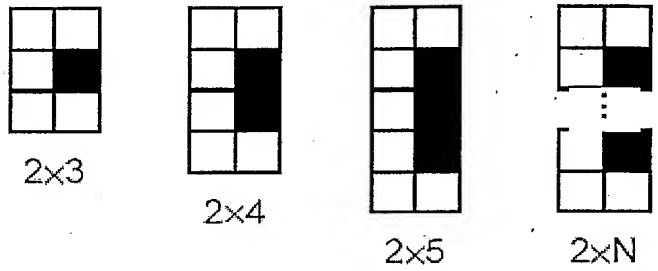


Figure 12B

# Minutiae Patterns

Figure 13



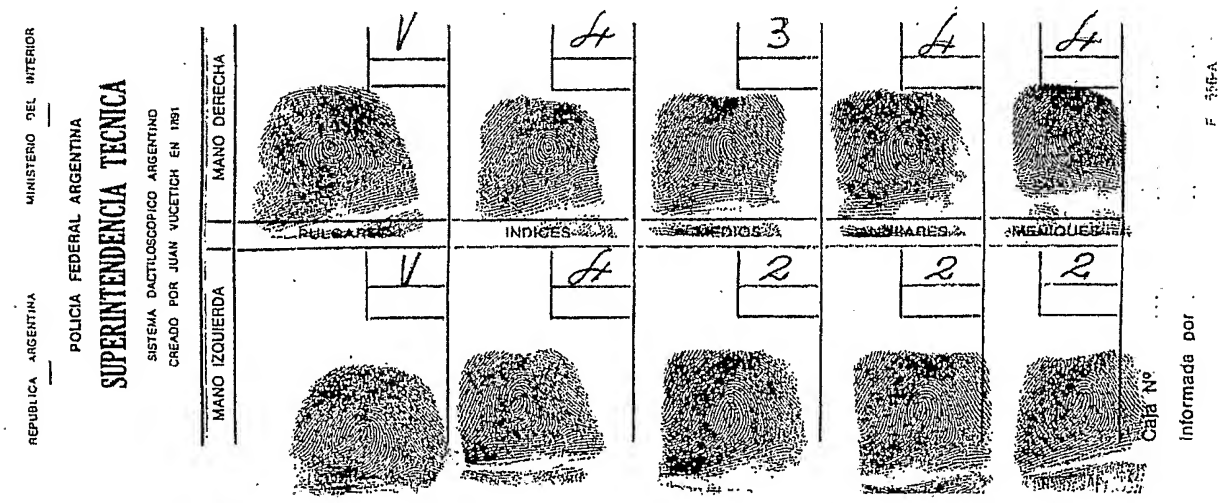
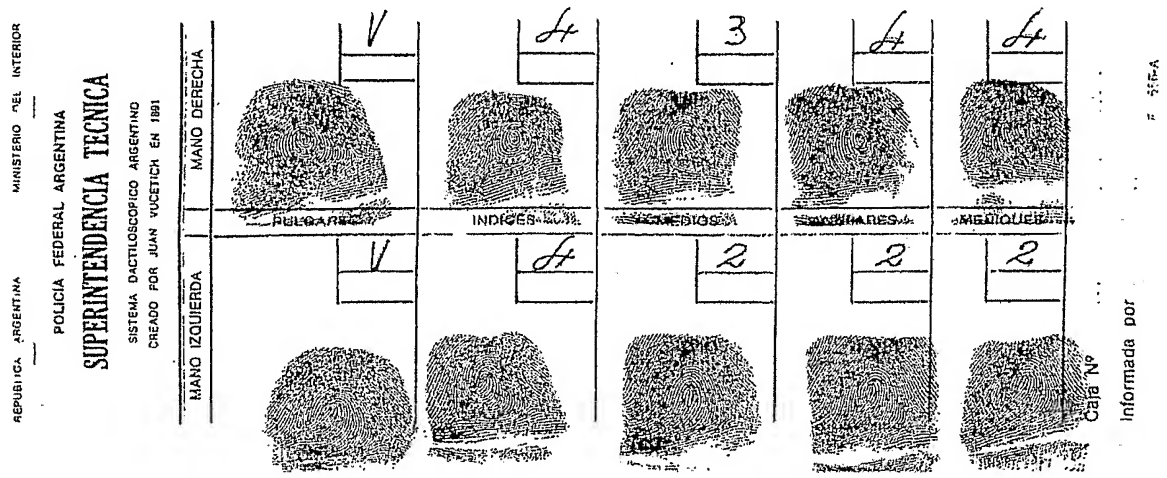




Figure 14

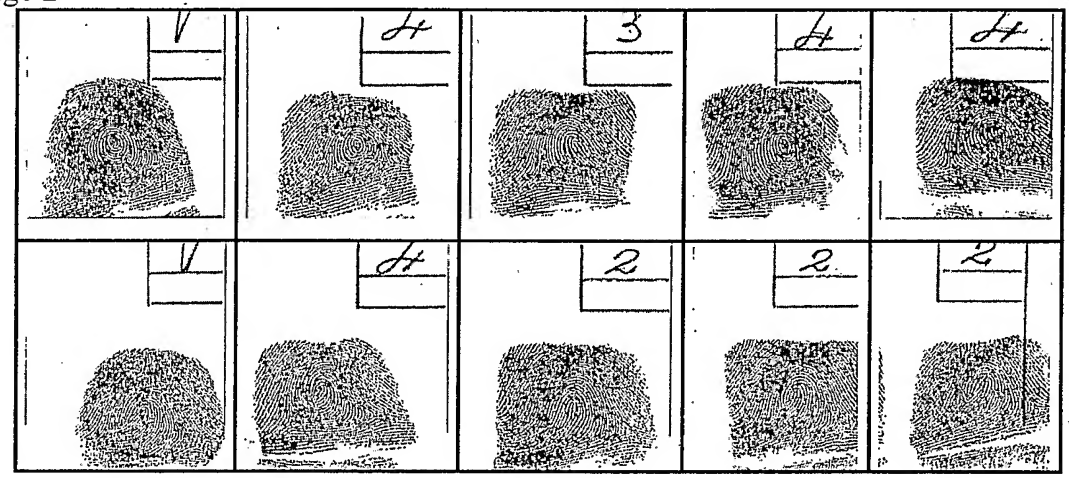
## Digitalized Fingerprint Card

Image 1



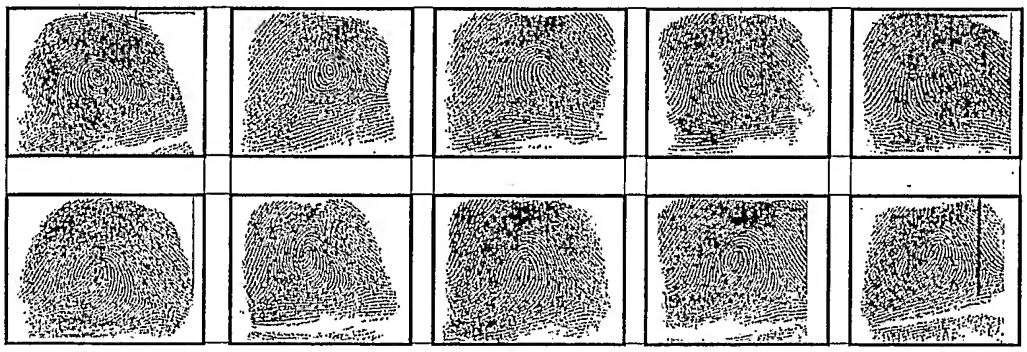

## Multiple Segmentation

Image 2



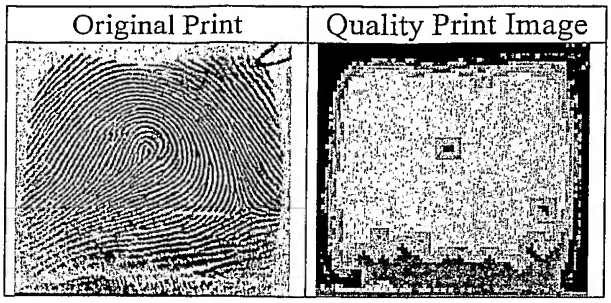
## Individual Segmentation

Image 3



## Quality

Image 4




Each 8 x 8 block of pixels is assigned a value—0, 1, 2, 3, or 4—representing the quality level of the block. In turn, each value represents a quality percentage and is shown graphically with a color, varying between black and white:

0 = 0 % = black
1 = 25 % = dark gray
2 = 50 % = medium gray
3 = 75 % = light gray
4 = 100 % = white

To obtain the general quality percentage or level of the print, the following formula is applied:

$\sum$ values of all blocks / Number of blocks

## Prints with a Marked Core

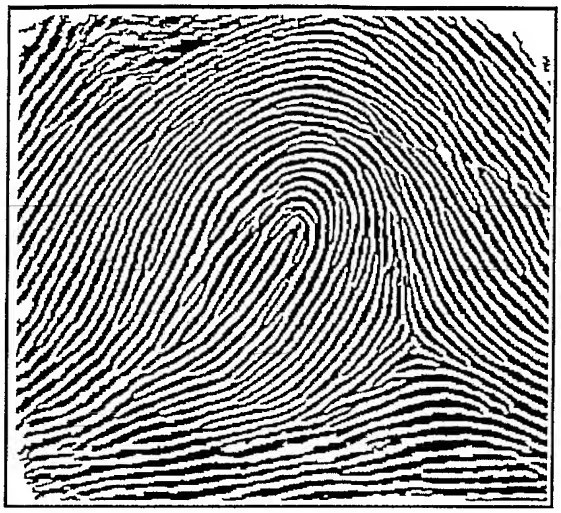
Image 5

## Binarized Print

Image 6

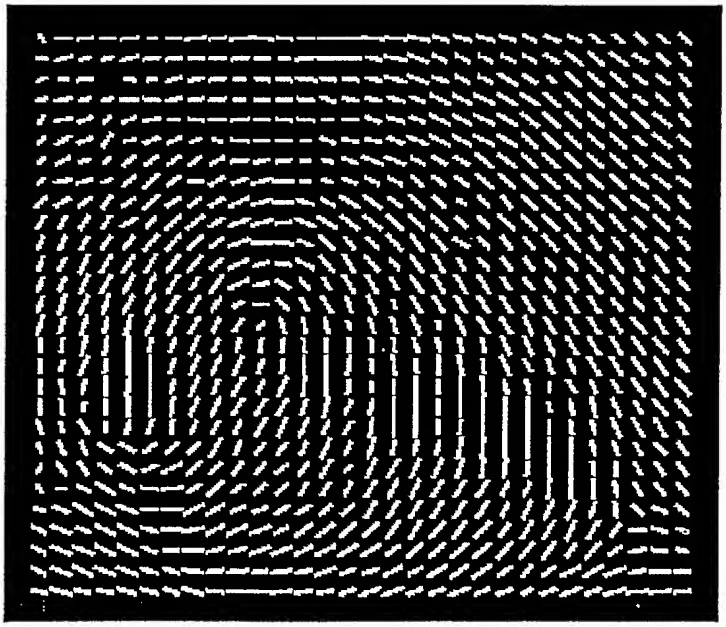
Gray scale print

Binarized Print



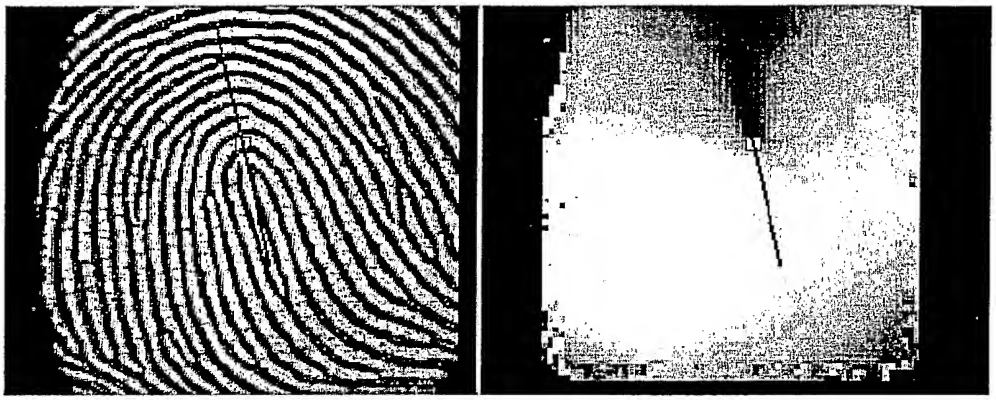
## Local Orientation Graph

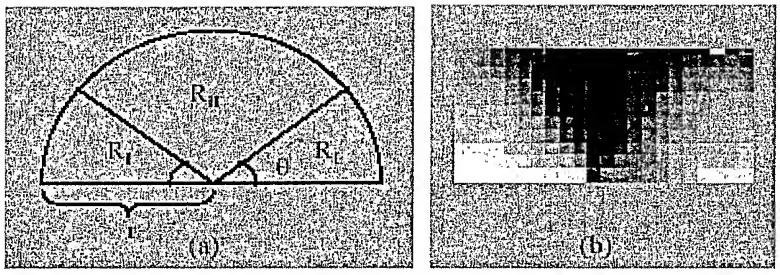
Image 7



General Orientation Graph of a Print

Image 8






(a) The circular mask to extract the central point of the print
(b) Map generated from applying the circular mask

Print with General Orientation Inserted on a Grid

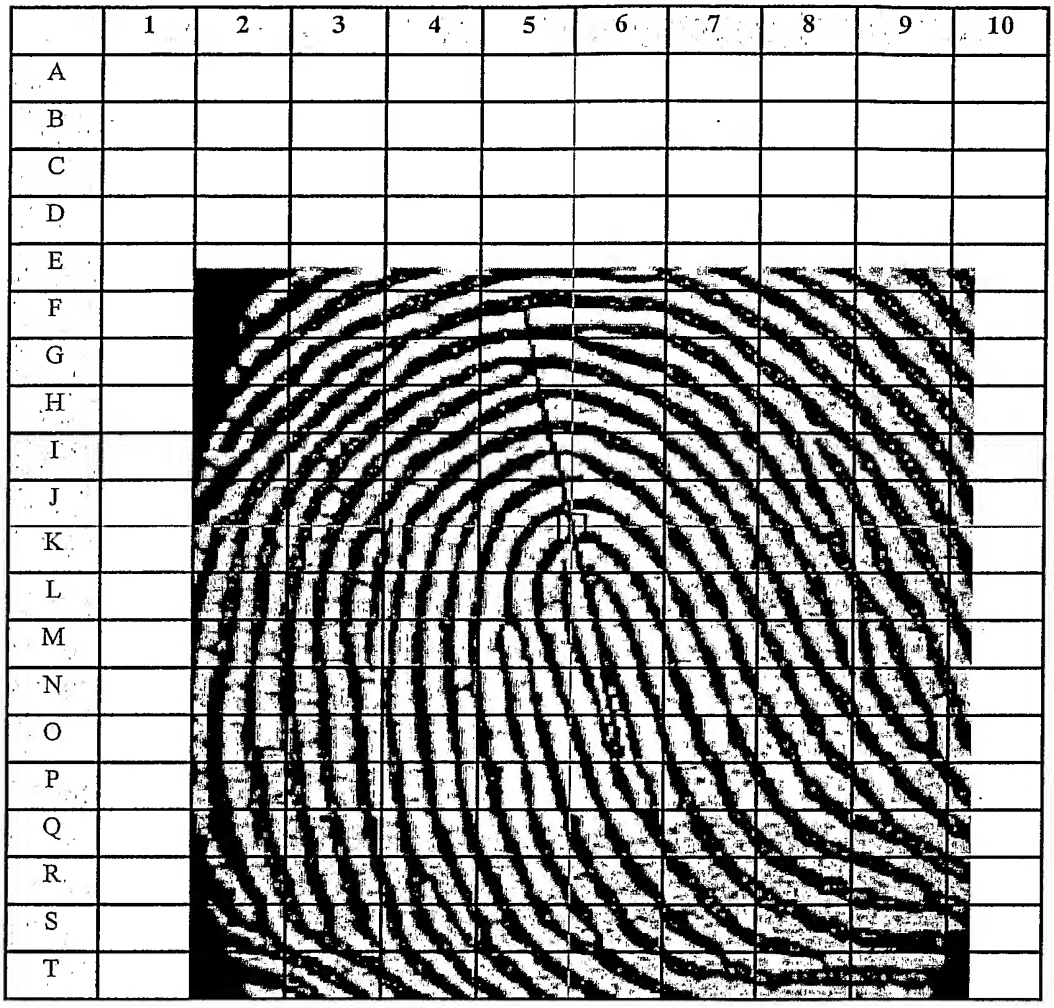



Image 9